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GEOGRAPHIC VARIATION IN THE CHICKEN TURTLE

Deirochelys reticularia Latreille

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The chicken turtle, *Deirochelys reticularia*, was described as *Testudo reticularia* by Latreille in 1801. Almost simultaneously, the same turtle was described by Daudin as *Testudo reticulata*. Both descriptions were based upon data gathered by Bosc in North America (1798–1800). During his visit to the United States, Bosc spent some time at Charleston, visiting with his countryman, André Michaux, and presumably his collection of the original specimen and his observations on the chicken turtle were made at that time. The provenance of this specimen, in the custom of that period of zoological taxonomy, was stated merely as "Carolina"; the Michaux Garden was located about twelve miles north of Charleston, and the type specimen may well have come from this vicinity. Harper (1940, p. 711) and Schmidt (1953, p. 104) restricted the type locality to Charleston, South Carolina, and this restriction is appropriate.

The question of the priority of *Testudo reticularia* Latreille over *Testudo reticulata* Daudin has been ably and thoroughly discussed by Harper (op. cit., pp. 710–711). According to this author, the Latreille name antedates the Daudin name by several months and thus is the valid name for the chicken turtle of the southern United States.

Agassiz first recognized the distinctive characters which differentiate *Deirochelys* from other emydid genera. Until that time, the chicken turtle had been placed in three genera (*Testudo, Emys, Terrapene*) and subsequently has been considered as belonging to the genera *Clemmys* and *Chrysemys*. Agassiz separated *Deirochelys* from the remaining Emydidae on the basis of the long neck and the mode of articulation of the neck vertebrae. Even more striking, as

Carr (1952, p. 316) has pointed out, is the slimness of the free upper ends of the ribs, which can thus accommodate the large retractor muscles of the neck. From all other North American emydids except *Emys* and *Clemmys marmorata*, *Deirochelys* differs in that the first central lamina is in contact with five rather than three marginal laminae. Williams (1950) did not examine specimens of *Deirochelys* in his study of the cervical articulation of turtles, and skeletons have not been available to me. Such study should prove valuable and interesting, because of the elongate neck and presumed concomitant muscular and skeletal modifications of *Deirochelys*.

No one has made mention of geographic variation in *Deirochelys reticularia*, and indeed little seems to be known regarding the chicken turtle in general. However, Carr (op. cit., p. 318) noted that a hatchling from southern Louisiana possessed a "dark linear pattern following the seams of the plastron." This character, often somewhat modified through age, occurs consistently in populations west of the Mississippi River and distinguishes these western turtles from those of the eastern United States. Coloration and carapace shape serve also to differentiate populations of *Deirochelys* on the Florida peninsula and the adjacent continental mass, so that three subspecies are herein recognized, two of which are described as new.

Three hundred and twenty-five specimens have been examined, with the following distributions by states: Oklahoma, 3; Arkansas, 8; Texas, 42; Louisiana, 57; Mississippi, 7; Alabama, 5; Georgia, 52; Florida, 113; South Carolina, 32; North Carolina, 6. Most of these are entire specimens, but a few are dry shells or preserved heads only. The chicken turtles from the following collections have been examined. I wish to express my thanks to the respective curators of these collections and to private individuals for allowing me to borrow study material in their care: American Museum of Natural History, Charles M. Bogert (AMNH); Arkansas Polytechnic College, Allan H. Chaney (APC); Chicago Academy of Sciences, Howard K. Gloyd (CAS); Charleston Museum (ChM); Carnegie Museum, Neil D. Richmond (CM); Chicago Natural History Museum, Robert F. Inger (CNHM); Cornell University, Edward C. Raney (CU); Museum of Comparative Zoology, Arthur Loveridge (MCZ); Strecker Museum, Bryce C. Brown (SM); Texas Cooperative Wildlife Museum, W. B. Davis (TCWM); Texas Natural History Collection, University of Texas, W. F. Blair (TNHC); Tulane University, Fred R. Cagle (TU); United States National Museum, Doris M. Cochran (USNM); University of Florida, Archie F. Carr, John W. Crenshaw and Duke Wilder (UF); University of Georgia,

Bernard Martof; University of Illinois, Museum of Natural History, Hobart M. Smith (UIMNH); University of Kansas, Edward R. Taylor (UK); University of South Carolina, Harry W. Freeman; University of Michigan, Museum of Zoology, Norman E. Hartweg and William E. Duellman (UMMZ); University of Oklahoma, Museum of Zoology, Charles C. Carpenter (UOMZ). Specimens from private collections have been lent by Bryce C. Brown (BCBC), John W. Crenshaw, Richard E. Etheridge, Edmund R. Cuthbert, and Robert L. Humphries. L. Neil Bell, Larry H. Ogren, Dennis R. Paulson, and Donald W. Tinkle have supplied me with living specimens of turtles from Florida, Texas, and Louisiana, and Adrian A. Armour, Julian R. Harrison III, John A. Quinby, Daniel R. Stanland and others have collected specimens for me in South Carolina. The specimens in the University of South Carolina were collected during a survey of the herpetofauna of the Savannah River Plant, sponsored by the Atomic Energy Commission. I wish to thank Doris M. Cochran, Roger Conant, James A. Peters, and Arthur Loveridge for assistance in checking references in certain literature. The plates are the work of Isabelle Hunt Conant, and I wish to thank her for her faithful reproductions of the original specimens.

Carr's (1952, p. 49) method was used in taking shell measurements; measurements were taken with vernier calipers when possible, and larger individuals were measured with dividers for all measurements except depth, for which calipers were employed. All measurements are in millimeters. The following abbreviations are used: CL, greatest length of carapace; PL, greatest length of plastron; C3/4, width of carapace at seam between marginals 3 and 4; C5/6, width of carapace at seam between marginals 5 and 6; C8/9, width of carapace at seam between marginals 8 and 9; CW, greatest width of carapace; D, greatest depth of shell. The head width was taken at the level of the anterior border of the tympanum. All capitalized color names are from Ridgway (1912).

In the subspecies discussions, specimens have been segregated into three categories: (1) Juveniles (individuals from hatchling size to about 79 mm.). This group is generally characterized by the retention of the primary or hatchling carapace laminae surrounded by a smooth or lightly striated zone of new growth. (2) Subadults (individuals with finely striated laminae which have not reached adult size. The size range is from about 68 mm. to 141 mm.). The placing of a single specimen in either the juvenile or the subadult category depends upon the appearance of the carapace laminae,

and this accounts for the overlap in carapace measurements of these two groups. (3) Adults (males with carapace lengths in excess of 96 mm. and females with carapace lengths in excess of about 155 mm. except in the subspecies *miaria* where females are considered adult at lengths of 139 mm. and over). The subadult and adult categories overlap because large subadult females are larger than small adult males.

Latreille (1801, p. 124) stated that the specimen of *Testudo reticularia* available to him measured 7 inches in carapace length, 4½ inches in width, and 3 inches in depth. These dimensions agree with those of a female from Aiken County, South Carolina, and, since male *Deirochelys* in South Carolina do not reach this size, the original Bosc specimen was almost certainly an adult female. Latreille (op. cit., p. 126) said that the plastron was yellow, and this affirms the fact that the original specimen did not come from Florida. M. Jean Guibé of the Muséum National d'Histoire Naturelle has informed me (letter, December 13, 1954) that the type specimen of *Testudo reticularia* Latreille "doit être considéré comme perdu." With the description of two new subspecies of this turtle in the present paper, it seemed suitable to designate both a neotype and a neoallotype from the vicinity of Charleston, South Carolina, and, since the type specimen was almost certainly a female, a female has been selected as the neotype.

Genus **Deirochelys** Agassiz

Deirochelys Agassiz, 1857, Contr. Nat. Hist. U. S., **1**: 441.

Dirochelys Baur, 1889, Amer. Nat., **22**: 1099–1100.

Dierochelys Löding, 1922, Alabama Mus. Nat. Hist., mus. paper no. 5, p. 45.

Diagnosis.—An emydid turtle with an oval or cuneiform carapace outline; laminae of carapace dark, striated, and with a reticulum of yellowish lines and usually a light border; plastron unhinged and immovable, yellow or orange in color, sometimes with a seam-following dark plastral pattern; bridge with or without a dumbbell-shaped figure; shell deep or flattened; marginal laminae 25, often with a dark blotch on the ventral surface; four pairs of lateral laminae; five central laminae; neck elongate and about equal to length of carapace; skin black or brown with lines and markings yellowish or greenish; a wide band of yellow on anterior surface of forelimb; a series of vertical, alternating black and yellow bars between tail and hind limbs on rump; free ends of ribs very slim for accommodation of large retractor muscles of neck; first central lamina in con-

tact with five marginal laminae (precentral, marginals 1 and 2 on each side).

Deirochelys reticularia reticularia Latreille

Testudo reticularia Latreille, 1801, *in* Sonnini and Latreille, Hist. Nat. Rept., **1**: 124, pl. 6, fig. 1.

Testudo reticulata Daudin, 1801, Hist. Nat. Rept., **2**: 144, pl. 21, fig. 3; Le Conte, 1830, Ann. Lyc. Nat. Hist. New York, **3**: 103.

Emys reticulata Schweigger, 1812, Königsberg. Arch. Naturwiss. Math., **1** (3), pp. 300, 346, **1** (4), p. 425; Schweigger, 1814, Prod. Mon. Chelon., pt. 2, p. 31; Merrem, 1820, Tent. Syst. Amphib., p. 26; Duméril and Bibron, 1835, Erpet. Gen., **2**: 291; Holbrook, 1838, N. Amer. Herp., 1st ed., **2**: 41, pl. 7; Holbrook, 1842, N. Amer. Herp., 2nd ed., **1**: 59, pl. 7; Holbrook, 1848, *in* White, Statistics of Georgia, Fauna and Flora, p. 13; Le Conte, 1854, Proc. Acad. Nat. Sci. Philadelphia, **7**: 189.

Emys reticularia Gray, 1844, Cat. Turtles Brit. Mus., p. 25; Gray, 1855, Cat. Shield Reptiles Brit. Mus., p. 27.

Terrapene reticulata Bonaparte, 1830, Osserv. Seg. Ed. Regno Anim., p. 155; Bonaparte, 1830, Ann. Stor. Nat. (Bologna), **4** (3), p. 369.

Deirochelys reticularia Gray, 1870, Suppl. Cat. Shield Reptiles Brit. Mus., pt. 1, p. 39; Stejneger and Barbour, 1917, Check List of N. Amer. Amphibians and Reptiles, p. 121 (part); Carrington, 1929, Copeia, **172**: 82; de Sola and Abrams, 1933, Copeia, **1**: 11; Pope, 1939, Turtles U. S. and Canada, pp. 234–235 (part); Brimley, 1939–43, Reptiles and Amphibians N. Car., Carolina Tips, Installment 31, second unnumbered page (part); Carr, 1940, Univ. Fla. Publ., Biol. Sci. Ser., **3** (1), p. 105 (part); Jopson, 1940, Herpet., **2** (2), p. 43; Ditmars, 1946, Reptiles N. Amer., pp. 418–419 (part), pl. 120, lower fig.; Smith and Buechner, 1947, Bull. Chicago Acad. Sci., **8** (1), pp. 1–16; Neill, 1948, Herpet., **4** (3), p. 114; Brown, 1950, Check List of Reptiles and Amphibians, Texas, p. 234 (part); Carr, 1952, Handbook of Turtles, pp. 316–319 (part); Chermock, 1952, Geol. Surv. Alabama, mus. paper no. 33, p. 51; Schmidt, 1953, Check List of N. Amer. Amphibians and Reptiles, p. 104 (part); Carr and Goin, 1955, Reptiles, Amphibians, and Fresh-water fishes of Fla., p. 246 (part); Freeman, 1955, Univ. S. Car. Publ. Biol., ser. 3, **1** (1), pp. 241–243; Mertens and Wermuth, 1955, Zool. Jahrb. (Syst.), **83**, (5), pp. 348–349 (part); Smith and List, 1955, Amer. Mid. Nat., **53** (1), p. 125.

Deirochelys reticulata Agassiz, 1857, Contr. Nat. Hist. U. S., **1**: 441, **2**, pl. 1, figs. 14–16, pl. 7, figs. 17–19; Siebenrock, 1909, Zool. Jahrb., suppl. vol. **10** (3), p. 485 (part); Deckert, 1918, Copeia, **54**: 31.

Dirochelys reticularia Baur, 1889, Amer. Nat., **22**: 1099–1100.

Clemmys reticularia Strauch, 1862, Mem. Acad. Sci. St. Petersburg, (7), **5** (7), p. 32; Strauch, 1865, Mem. Acad. Sci. St. Petersburg, **8** (13), p. 78.

Chrysemys reticulata Cope, 1875, Bull. U. S. Nat. Mus., **1**: 53; Davis and Rice, 1883, Bull. Illinois State Lab. Nat. Hist., **1** (5), p. 56; True, 1883, Bull. U. S. Nat. Mus., **24**: 35 (part); True, 1884, Fish. Indust. U. S., sec. 1, p. 157 (part); Boulenger, 1889, Cat. Chel. Brit. Mus., p. 75 (part); Lind-

holm, 1901, *in* Lampe, Cat. Rept. Samml. Naturhist. Mus., Wiesbaden, p. 10.

Chrysemys reticulatus Wright and Funkhouser, 1915, Proc. Acad. Nat. Sci. Philadelphia, 67: 117.

Dierochelys reticularia Löding, 1922, Alabama Mus. Nat. Hist., mus. paper no. 5, pp. 45–46 (part); Haltom, 1931, Geol. Surv. Ala., Alabama Mus. Nat. Hist., mus. paper no. 11, p. 137 (part).

Type locality.—Carolina; by restriction, vicinity of Charleston, Charleston County, South Carolina.

Neotype.—ChM 54.48.1, adult female, taken 9 miles northwest of Charleston, Charleston County, South Carolina, on April 1, 1954, by T. A. Beckett.

Neoallotype.—ChM 52.140.5, adult male, taken 2.1 miles north, thence 1.2 miles west of Cainhoy, Berkeley County, South Carolina, on December 20, 1952, by Julian Harrison III and John A. Quinby.

Specimens examined.—NORTH CAROLINA: Craven Co., New Bern, 2; Carteret Co., Harker's Island, Willow Pond, 1; New Hanover Co., Wrightsville, 1, Wilmington, 1; Brunswick Co., Ft. Caswell Beach, 1. SOUTH CAROLINA: Williamsburg Co., Kingstree, 1, Lanes, 1; Clarendon Co., Santee National Wildlife Refuge, Lake Marion, 1 (not mapped); Georgetown Co., Kinloch Plantation, 12 miles south of Georgetown, 1; Berkeley Co., Lake Moultrie, near Pinopolis, 1 (not mapped), Medway Plantation, Back River, 1, 0.9 miles north of Cainhoy, 1 (not mapped), 6 miles north of Cainhoy, 1, 2.1 miles north, thence 1.2 miles west of Cainhoy, 8; Charleston Co., Drayton Station, 1; Dorchester Co., Summerville, 1; Aiken Co., 3 miles northeast of Ellenton, 3, pond at point where State Highway 19 crosses Tim's Prong of Upper Three Runs Creek, 1, northwest edge of Ellenton, 1, Savannah River area, 1; Barnwell Co., 1 mile west of Snelling on South Carolina Route 64, thence 1 mile south of South Carolina Route 64, 4; Jasper Co., Great Swamp, tributary of New River, 1; Beaufort Co., Bluffton, 1. GEORGIA: Wayne Co., near Liberty County line, 1; Lee Co., Usry Plantation, 1; Worth Co., 9.7 miles north of Sylvester, 1; Baker Co., Mimsville, 12, 4 miles northeast of Emory Field Station, 6, 2.0 miles east of Miller County line, 1, 0.1 miles south of Dougherty–Baker County line on U. S. Highway 91, 1, 100 yards south of Dougherty–Baker County line, 1, Thompson Pond, ca. 5 miles northwest of Newton, 1, no other locality, 2; Grady Co., Beachton, Birdsong Plantation, 1; Thomas Co., 8 miles south of Thomasville, 1, no other locality, 1; Clinch Co., vicinity of Stockton, 1, vicinity of Homerville, 2; Lowndes Co., Valdosta, 1; Ware Co., 9 miles southeast of Waycross, 1, Okefinokee

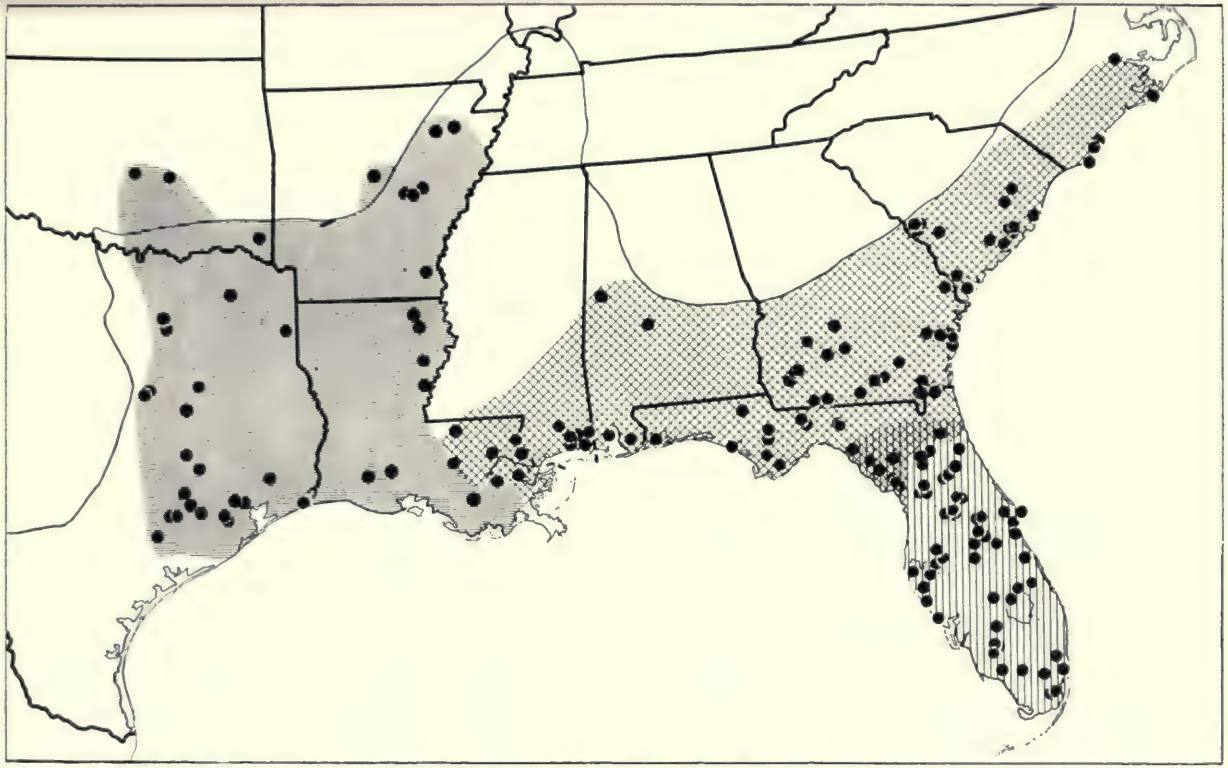

FIG. 102. Map showing distribution of three subspecies of *Deirochelys reticularia* Latreille. Black circles represent localities from which specimens have been examined. The range of *D. r. reticularia* is represented by crosshatching, that of *D. r. chrysea* by vertical lines, and that of *D. r. miaria* by horizontal lines. Overlap of symbols represents intergradation in north central Florida.

Swamp, 2, Okefinokee Swamp, Chesser's Island, 1, Okefinokee Swamp, Honey Island, 1; Charlton Co., Camp Cornelia, 1, Folkston, 1, 1 mile south of Trader's Hill, 1. FLORIDA: Escambia Co., Pensacola, 2; Washington Co., near Chipley, 1; Bay Co., 4 miles west of Panama City, 1; Calhoun Co., 6 miles south of Blountstown, 4, Chipola River, 4 miles south of Scott's Ferry, 1; Gulf Co., 10 miles west of Wewahitchka, 1; Gadsden Co., 13 miles northwest of Tallahassee, 1; Leon Co., 2 miles southwest of Tallahassee, 1; Franklin Co., east of Eastpoint, 1, Mexico Beach, 1; Jefferson Co., ½ mile northwest of Lamont, Highway 24, 1; Madison Co., 1 mile southeast of Lamont, 1; Nassau Co., 1.7 miles south of Hilliard, 1. ALABAMA: Greene Co., Tombigbee River, 2; Dallas Co., 1.4 miles northeast of Orrville, 1; Mobile Co., Mobile, 1; Baldwin Co., 9 miles north of Foley, 1. MISSISSIPPI: Stone Co., 1; Harrison Co., Biloxi, 2, 10 miles north of Biloxi, 1; Jackson Co., Moss Point, 1, 16 miles north of Van Cleave, 1, 2.5 miles north of Hurley, 1. LOUISIANA: Washington Parish, 11 miles west of Bogalusa, 1 (not mapped); St. Tammany Parish, 8 miles from Pearl River, 3, Sun, 1; Tangipahoa Parish, 5 miles east of Hammond, 1.

Geographic distribution.—The Atlantic and Gulf coastal plains, from east central North Carolina through South Carolina, Georgia, northern and western Florida, Alabama, Mississippi, and the Florida Parishes of Louisiana (see map, fig. 102). Intergrades between *D. r. reticularia* and *D. r. chrysea* occur in north central Florida in Taylor, Dixie, Levy, Gilchrist, and Clay counties.

Diagnosis.—*Deirochelys r. reticularia* differs from *D. r. chrysea* in the generally less bright coloration of the former, the much narrower dorsal reticulation, which is greenish or brownish, the narrow yellow edging of the carapace, and the sporadic occurrence of a plastral spot at the juncture of the femoral and anal laminae. The black spots on the ventral side of the marginals at the level of the bridge are present in 72 per cent of the specimens examined; comparison with specimens of *D. r. chrysea* shows that 43 per cent of these specimens have marginal black spots at the level of the bridge. A chi square test for these data indicates that this difference is significant.

The shape of the carapace distinguishes *D. r. reticularia* from *D. r. chrysea*. The shell is ovate in shape, and not cuneiform and expanded as in *D. r. chrysea;* there is seldom the constriction at the level of marginals 5 and 6 that occurs in *D. r. chrysea*. *D. r. reticularia* is flatter than *D. r. chrysea*. See Tables 1 and 2.

D. r. reticularia differs from *D. r. miaria* in never having the dendritic plastral pattern following the seams. When a plastral pattern is present in *D. r. reticularia*, it is a poorly defined blotch, with occasional antero-median extension, at the femoral-anal suture. Also, *D. r. reticularia* is less flat than *D. r. miaria*.

Description of neotype.—An adult female (fig. 103) with the following measurements: CL, 199; PL, 182; C3/4, 120; C5/6, 144; C8/9, 128; CW, 144; head width, 30.5; D, 83; width of posterior lobe of plastron, 79.3; width of bridge, 63.2. Ratios: D/CW, 0.58; C5/6/CL, 0.72, CW/CL, 0.72. The shell is ovate in outline when viewed dorsally, and highly domed; the greatest width of the carapace is at the level of marginal 7 and the greatest height at central 3. The posterior marginals are moderately flaring, and the lateral marginals almost vertical. The carapace is dark brown in color, and the reticulations narrow (not more than 1.5 mm. in width). The carapace is edged with yellow for its entire margin, but only narrowly so. The plastron is yellow. The dumbbell-shaped figure on the bridge is separated into two separate elongate hollow blotches at the pectoral-abdominal suture. The ventral surfaces of marginals 4, 5, and 6 have solid black spots on the right side and marginals 4 and 5 have black spots on the left. These marginal spots are oval and are restricted to a single marginal except for a slight overlap of the pigment onto the next most posterior marginal.

The head skin is black and the yellowish lines are prominent. Five lines enter the posterior margin of the eye, the most dorsal and most ventral (orbital) lines being the widest and most prominent. The median head line is joined unilaterally to the left canthal line and extends posteriorly about 6 mm. behind the eye. Two paramedian head lines begin just posterior to the eye and extend posteriorly onto the neck. A post-ocular line begins at the corner of the eyelids and extends posteriorly as a broadening stripe. Each of these head lines is separated by three faint yellow lines. The dorsal and lateral aspects of the neck are black and the lines only faintly discernible. The chin has a horseshoe-shaped yellow figure with the open end projecting posteriorly and extended as two broad yellow stripes onto the neck. An equally broad yellow stripe begins at the apex of the horseshoe and extends posteriorly on the mid-ventral line of the neck. There is a yellow line on the upper beak extending from the nares to the margin of the beak and continued as a blotch on the lower beak, which is elsewhere striped with yellow and black.

The forelimbs have a wide (about 8 mm.) band of yellow across the anterior aspect at the level of digits 3 and 4, and the ventral edge of the forelimb has a yellow line. The webs between the digits are yellow. Between the elbow and the carapace there are 9 yellow lines on the black skin. The hind limbs are black dorsally and yellow ventrally except for the palmar surfaces of the feet, which are black. The webs are yellow. Between the knee and the vent there are 7 to 9 yellow vertical lines on the black skin. The tail is terete and short (31 mm. from vent to tip of tail), and the vent lies immediately posterior to the posterior margin of the plastron.

Description of neoallotype.—An adult male (fig. 104) with the following measurements: CL, 141; PL, 127; C3/4, 83; C5/6, 96; C8/9, 92; CW, 101.4; head width, 24.0; D, 60; width of posterior lobe of plastron, 58.2; width of bridge, 42.0. Ratios: D/CW, 0.59; C5/6/CL, 0.68; CW/CL, 0.72. The shell is ovate in outline and moderately high on the mid-dorsal line; the greatest width of the carapace is at the level of marginal 7 and the greatest height at central 3. The posterior marginals are moderately flaring, especially marginals 7, 8, and 9, and the lateral marginals are almost vertical. The carapace is dark brown in color, with narrow reticulations and mid-dorsal line as in the female. The carapace is edged with yellow but not widely or prominently so, except at the confluence of the reticulum with the yellow marginal border. The plastron is yellow. The bridge pattern is almost absent, the dumbbell-shaped figure being restricted to a diffuse small blotch on the inguinal laminae. The ventral surfaces of the marginals are immaculate except for small dots on marginals 4 and 5 on the right side and 3 and 4 on the left.

The head pattern resembles that of the neotype in most details but differs in that the median head line is not attached to the canthal line and the paramedian I and the post-ocular lines are joined on each side by a transverse yellow line at the level of the anterior third of the tympanum. There are three wide yellow bands on the neck, but no horseshoe-shaped figure as in the neotype. The coloration and pattern of the limbs are essentially those of the female described above. The tail is stout, cylindrical, and tapering (26 mm. from vent to tip of tail), and the vent is about 16 mm. posterior to the rear margin of the plastron. The penis is extruded and is uniformly black except for the pale yellow proximal ventral surface.

In the following discussions, specimens of *D. r. reticularia* from western and northern Florida and southern Georgia have not been employed.

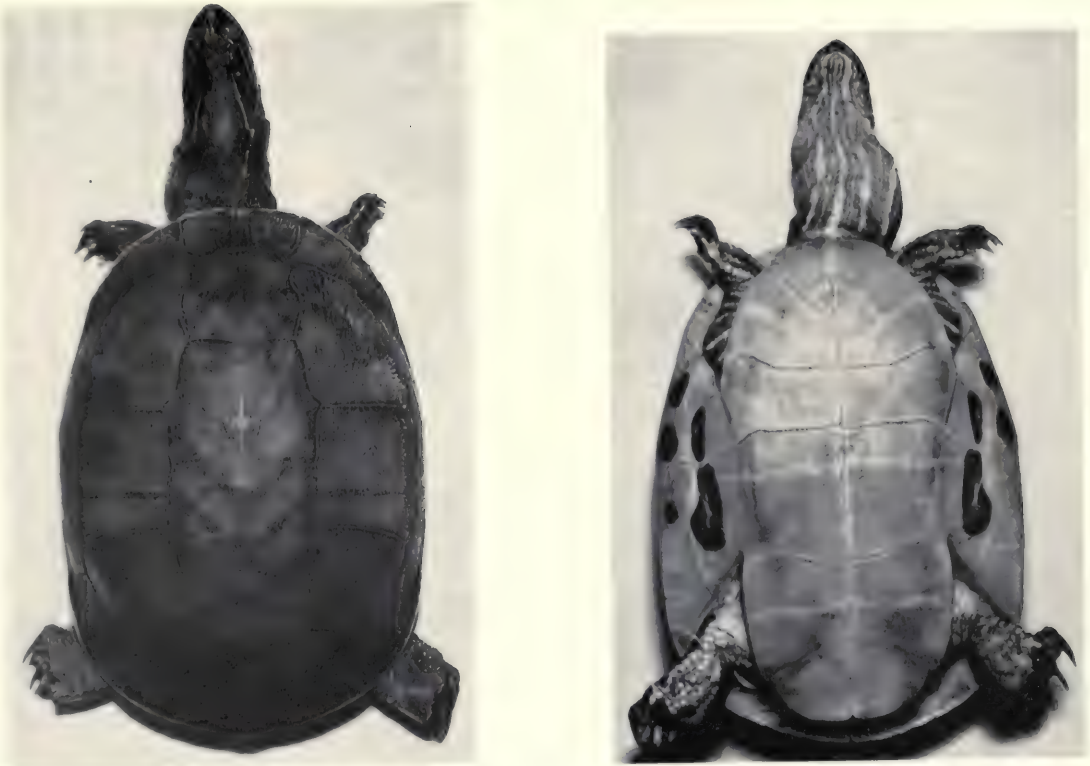

FIG. 103. Dorsal and ventral views of the neotype of *Deirochelys r. reticularia* (ChM 54.48.1) from 9 miles northwest of Charleston, Charleston County, South Carolina.

FIG. 104. Dorsal and ventral views of the neoallotype of *Deirochelys r. reticularia* (ChM 52.140.5) from 2.1 miles north, thence 1.2 miles west of Cainhoy, Berkeley County, South Carolina.

JUVENILES

The sixteen juvenile individuals available for study range in carapace length between 29.7 and 55.3 mm. The ratio of CW to CL varies between 0.85 and 0.97, with the smaller individuals having the higher ratios; in very small individuals the shell is more nearly circular in outline. With increasing growth, the shell becomes longer and somewhat broader posteriorly in the region of marginals 6 and 7, but it seldom reaches the extremely cuneiform configuration of the Floridian form. In general, the ground color of the carapace is dull brownish to olive, and in the smallest individuals the reticulum and mid-dorsal lines are yellow and obvious, but are not nearly

so broad as in juvenile *D. r. chrysea*. The shell is margined with yellow, but not to so prominent a degree as in the more southern subspecies. The carapace is high mid-dorsally, and the ratio of D to CW varies between 0.45 and 0.58. In the largest turtle here considered juvenile, the reticulations are already fine and obscured by the darker coloration of the carapace. One specimen (TU 6040) has the only deformed carapace in the entire series of *Deirochelys* examined; the centrals have grown to the detriment of the left lateral laminae, which are compressed in an antero-posterior direction and less developed than the right laterals.

The plastron is immaculate and yellow in all but four individuals; in these four specimens there is a small but well-defined spot at the juncture of the femoral and anal laminae. The bridge may be immaculate or may have a pattern. Two specimens have the bridge without either the dumbbell-shaped blotch or the spots on the marginals, while seven individuals have both the figure and the marginal spots. The remaining seven specimens have some portion of the dumbbell-shaped figure present and lack the marginal spots or have only faint ones. When the dumbbell is reduced, the disappearance of the figure comes at the junction of the pectoral and abdominal laminae, thus dividing the figure into an anterior and a posterior spot. The dumbbell may be solid or may have a hollow center. One specimen (TU 6038) has but a single dot on the bridge, on the under side of marginal 5.

The markings of the soft parts are typical of the species. Five lines enter the posterior border of the eye, of which the most dorsal and most ventral (orbital) are the widest and most prominent, the central is next in width, and the two intermediate stripes are often only faintly indicated. In all but one specimen the median head stripe does not join the canthal line. The ventral markings of the neck and chin consist of a small median yellow ovoid spot on the lower beak; in some specimens it is confluent with the median yellow stripe on the chin and neck. The two paramedian yellow ventral neck lines begin immediately posterior to the beak in some individuals, and in others they are confluent with the yellow line on the upper beak. In some specimens these paramedian ventral neck stripes are confluent with the median triangle on the lower beak. Thus the neck markings show a variety of conditions, unrelated to the geographic source of the specimen.

The six smallest individuals (carapace lengths between 29.7 and 35.8 mm.) have the primary or hatchling laminae rugose. The next group (carapace lengths between 36.5 and 44.5 mm.) has the laminae

smooth or finely striated, while the largest juvenile (carapace length 55.3 mm.) has the carapace completely smooth, with the striae only faintly indicated. The transition between the rugose and smooth conditions of the carapace occurs at a carapace length of about 50 mm.

SUBADULTS

Nine subadult individuals show the variation in pattern and configuration of *D. r. reticularia*. The carapace lengths vary between 68.3 and 146 mm. The shell outline is distinctly ovoid and not cuneiform. The ground color of the carapace is very dark (almost black) in most specimens and the dorsal reticulum and mid-dorsal yellow line are either very fine or obscured. The ratio of CW to CL varies between 0.67 and 0.81, the larger individuals having the smaller ratios. The shell is high in the dorsal median line and may even be slightly keeled, although this is not the common condition. The marginal edging is narrow and inconspicuous. The ratio of D to CW ranges between 0.51 and 0.63.

The plastron is immaculate in six specimens. The remaining three individuals have some degree of pigmentation on the median sutural line. One (ChM 43.56) has faint darkening at the juncture of the femoral and anal laminae; another (ChM 53.115.4) has a wide (4 mm.) irregular dusky band, most pronounced at the femoral-anal juncture, extending anteriorly as far as the pectoral laminae. A third individual (AMNH 46776) has a dusky band 11 mm. wide extending over the median sutures of the posterior three pairs of laminae and extending narrowly laterally at the seam of the abdominal and femoral laminae.

In no specimen is the bridge region immaculate. The dumbbell figure is absent in one individual but expressed variously in the others, and the spots on the marginals are present in all but one. There is a tendency for the dumbbell-shaped figure to be joined to the marginal spots by extensions of the black pigment from the figure to the spots; the anteriormost spot on marginal 4 is the first spot to show this joining, and the spot on marginal 5 is the next to be so joined.

Two specimens have the median head line joined to the canthal line and in six these two lines do not fuse. The head and neck striping does not differ from that of the juveniles.

ADULTS

Males.—In eleven males the shell is flattened and not deep, and the outline is roughly ovoid or slightly cuneiform. The dorsal

reticulation and mid-dorsal line are usually fine and hardly visible, but in some specimens they are quite as broad as those of the Florida subspecies. However, in preserved specimens, the reticulation is gray and not yellow as in the more southern subspecies; the coloration of these broadly marked turtles in life can only be conjectured, but since specimens of *D. r. reticularia* customarily have a greenish or brownish reticulum rather than an orange or yellow one as in the Florida turtle, it may be assumed that in life these aberrant individuals were not so brightly colored. The ground color of the carapace is dark brown to black, and the yellow edging of the marginals is very fine or absent. The entire lot displays a reduction of the carapace markings so that extreme individuals have these markings much reduced.

Two adult males show a vestige of a plastral blotch at the femoral-anal suture, but in these two individuals the spot is faint and ill-defined. One specimen lacks any bridge figure or marginal spots at the bridge level, and another lacks the marginal spots but has the dumbbell-shaped figure. The remainder show a variety of conditions; if both the bridge figure and marginal spots are present, there is a tendency toward fusion of the entire blotch system on the bridge, thereby forming a dumbbell-shaped figure with blunt dorsad extensions on the marginals. In some specimens there is fusion between the marginal spots as well as between the spots and the dumbbell-shaped figure, resulting in a complex and poorly defined bridge blotch.

Seven specimens have the median head stripe separate from the canthal line, while one has these two joined. In the other specimens the condition is indeterminate.

Females.—The twelve females show the extreme reduction of the dorsal reticulum and mid-dorsal line. The carapace is broadly oval and high and is colored dark brown to black. The pattern is represented by only the very finest lines, or hardly at all. The yellow edging of the marginals likewise disappears.

In two specimens there are faint traces of mid-ventral pigmentation at the femoral-anal suture, extending sporadically anteriorly over the abdominal laminae. The remaining specimens have immaculate plastra. The bridge lacks figures of any sort on one specimen, and the dumbbell-shaped figure is barely suggested in another. Two turtles lack marginal spots at the level of the bridge, but have the dumbbell figure present and bold. The remaining specimens have both the figure and the spots variously expressed.

The tendency to fusion of the figure with the marginal spots noted in adult males is shown here also; in two specimens the figure and the spots are fused.

The median head stripe is joined to the canthal line in six specimens, separate in three, and indeterminate in three.

Deirochelys reticularia chrysea subsp. nov.

Deirochelys reticularia Loennberg, 1894, Proc. U. S. Nat. Mus., **17**: 318; Stejneger and Barbour, 1917, Check List of N. Amer. Amphibians and Reptiles, p. 121 (part); Conant, 1930, Bull. Antivenin Inst. Amer., **4** (3), pp. 61, 63; van Hyning, 1933, Copeia, **1**: 7; de Sola, 1935, Copeia, **1**: 45; Brimley, 1939–43, Reptiles and Amphibians N. Car., Carolina Tips, Installment 31, second unnumbered page (part); Carr, 1940, Univ. Fla. Publ., Biol. Sci. Ser., **3** (1), p. 105 (part); Goin, 1943, Proc. Fla. Acad. Sci., **6**: 150; Ditmars, 1946, Reptiles N. Amer., pp. 418–419 (part); Brown, 1950, Check List of Reptiles and Amphibians, Texas, p. 234 (part); Carr, 1952, Handbook of Turtles, pp. 316–319 (part); Telford, 1952, Quart. Jour. Fla. Acad. Sci., **15** (3), pp. 184–185; Schmidt, 1953, Check List of N. Amer. Amphibians and Reptiles, p. 104 (part); Carr and Goin, 1955, Reptiles, Amphibians and Fresh-water Fishes of Fla., p. 246 (part); Mertens and Wermuth, 1955, Zool. Jahrb. (Syst.), **83**, (5), pp. 348–349 (part).

Deirochelys reticulata Siebenrock, 1909, Zool. Jahrb., suppl. vol. **10** (3), p. 485 (part).

Chrysemys reticulata True, 1883, Bull. U. S. Nat. Mus., **24**: 35 (part); True, 1884, Fish. Indust. U. S., sec. 1, p. 157 (part); Boulenger, 1889, Cat. Chel. Brit. Mus., p. 75 (part).

Dierochelys reticularia Löding, 1922, Alabama Mus. Nat. Hist., mus. paper no. 5, pp. 45–46 (part); Haltom, 1931, Geol. Surv. Ala., Alabama Mus. Nat. Hist., mus. paper no. 11, p. 137 (part).

Holotype.—UMMZ 111440, adult male, taken 5.8 miles east of Monroe Station, Collier County, Florida, on September 4, 1954, by L. Neil Bell.

Allotype.—UMMZ 100371, adult female, taken 5 miles west of Florida City, Dade County, Florida (no date), by Albert Schwartz.

Paratypes.—FLORIDA: St. Lucie Co., 23 miles southwest of Ft. Pierce (UMMZ 96513); Okeechobee Co., Taylor Creek Slough, 3.5 miles north of Okeechobee (ChM 54.202); Highlands Co., Red Hill, near Hicoria (AMNH 65620), Archbold Biological Station, near Hicoria (AMNH 65621); Glades Co., 12.4 miles southwest of Okeechobee (UMMZ 106309); Hendry Co., southeast of La Belle (UMMZ 106319–20); Collier Co., Immokalee (CAS 9158), 2 miles west of Immokalee (UF 7219), 7.7 miles south of Immokalee (UF 7220), 2 miles north of Copeland (ChM 55.39.2); Broward Co., New

River (MCZ 12497); Dade Co., Tamiami Trail (AMNH 49954), Miami (AMNH 9054), 5 miles west of Florida City (UMMZ 100370).

The following specimens of *D. r. chrysea* have been examined and are not designated as paratypes: FLORIDA: no other locality, 2; county indeterminate (not mapped), Colohatchee River, 1; Alachua Co., Gainesville, 4, 1 mile south of Gainesville, 1, east side of Lake Newnan, 1, Payne's Prairie, 1, Hale's Siding, 1, Orange Heights, 1, Monteocha, 3, 5 miles north of Micanopy, 1, no other locality, 3; Putnam Co., near Welaka, 1, Palatka, 1; Marion Co., 8 miles east of Ocala, 1, Silver Springs, 2, Dunnellon, 3, 15 miles east of Dunnellon, 1, near Levy County line, 1, near Rainbow Springs, 1, Eureka, 1; Lake Co., Lake Yale, 2, Leesburg, 4, near Leesburg, 1, 1.4 miles north of Leesburg, 1, Eustis, 1; Sumter Co., 2.8 miles southwest of Wildwood, 1; Orange Co., Winter Park, 1, Orlando, 2; Brevard Co., 3 miles north of Merritt Island P. O., 1, Eau Gallie, 1, Titusville, 1, Canaveral, 3; Osceola Co., 2 miles west of Kissimmee, 1, Kissimmee Prairie(?), 1, no other locality, 2; Polk Co., 3 miles south of Lake Wales, 1, Lowery Lake, 1; Hillsborough Co., Hillsborough River State Park, 6 miles south of Zephyrhills, 1, 16.6 miles south of Riverview, 1, west of Plant City, 1, Ruskin, 1, no other locality, 1; Pinellas Co., Gulfport, 5; Indian River Co., Fellsmere, 1; Manatee Co., Palmetto, 2; Sarasota Co., Sarasota, 1, Englewood, 1; Dade Co., Long Pine Key, 1.

Geographic distribution.—The Florida peninsula from Alachua, Putnam, and western Marion counties south to the tip of the peninsula, exclusive of the Florida Keys. Intergrades between *D. r. chrysea* and *D. r. reticularia* as noted in discussion of the latter form (see map, fig. 102).

Diagnosis.—*Deirochelys r. chrysea* differs from *D. r. reticularia* and *D. r. miaria* in that the plastron is orange or bright yellow and lacks a pattern of any sort, the dorsal reticulations are orange or golden and are bold and broad except in old specimens, and the orange edging of the carapace is broad and prominent. The black spots on the ventral surface of the marginals at the level of the bridge are absent in 57 per cent of the specimens examined.

The shape of the carapace is cuneiform (best noted in males of all sizes, and juveniles, and least expressed in females), and there is a constriction at the level of marginals 5 and 6. The carapace of *D. r. chrysea* is relatively higher than that of both *D. r. reticularia* and *D. r. miaria*. See Tables 1 and 2.

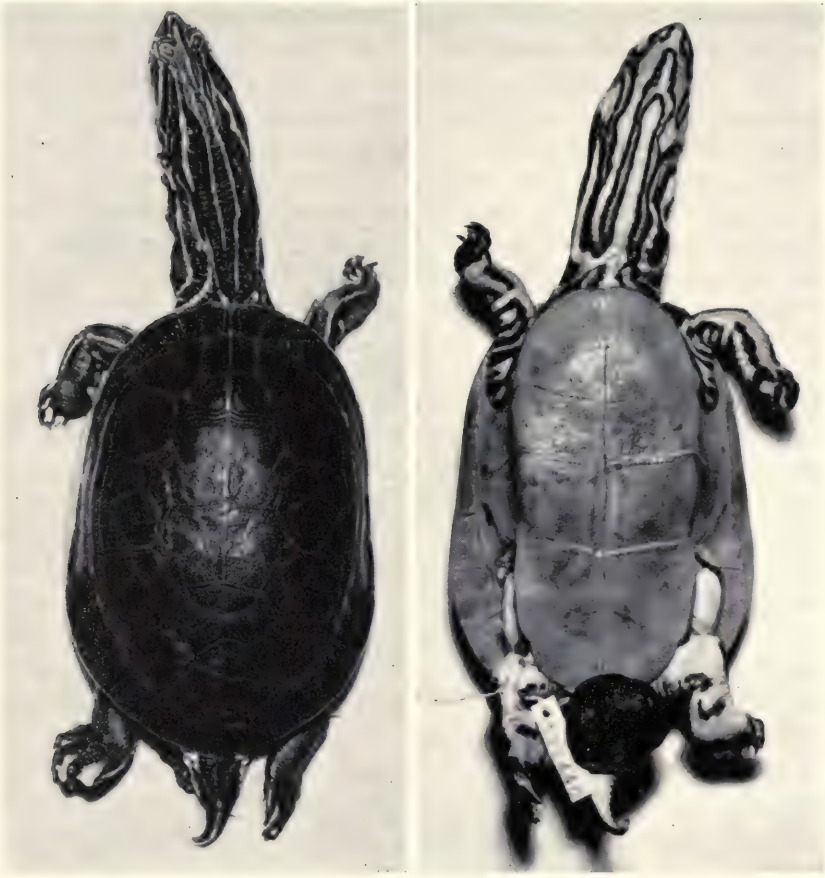

FIG. 105. Dorsal and ventral views of the holotype of *Deirochelys r. chrysea* (UMMZ 111440) from 5.8 miles east of Monroe Station, Collier County, Florida.

Description of holotype.—An adult male (fig. 105) with the following measurements: CL, 110.2; PL, 99.2; C3/4, 63.8; C5/6, 72.9; C8/9, 72.6; CW, 78.6; head width, 20.1; D, 45.8; width of posterior lobe of plastron, 45.8; width of bridge, 31.9. Ratios: D/CW, 0.58; C5/6/CL, 0.66; CW/CL, 0.71. The shell is cuneiform in outline when viewed dorsally and moderately high in the mid-dorsal line. The greatest width of the carapace is at the level of marginal 7 and the greatest height at central 3. The marginals are flaring from marginal 7 posteriorly. There is a marked constriction at the level of marginals 5 and 6 so that the carapace has a "pinched-in" look at this region. This constricted area plus the

flare of the more posterior marginals combine to give the overall wedge-shaped appearance to the shell.

In the following color description color notes from life have been utilized whenever possible. Capitalized color names are from Ridgway (1912). The carapace is Olivaceous Black (1) in color with the reticulations Tawny Olive. The mid-dorsal line and the reticulum are prominent and wide (as much as 2.5 mm.). The carapace is edged with Yellow Ocher, which grades to Buckthorn Brown posteriorly; this edging is especially prominent at the points of contact on the marginals with the lateral ends of the reticulations. The overall effect produced on the marginals is that they are brownish tinged with orange with isolated "islands" of black pigment at the marginal seams, cut off from the dorsal ground color. The plastron is immaculate Capucine Yellow. The bridge pattern is almost absent; there is a small black dot on the left inguinal lamina and a black blotch on the right. No marginals have ventral spots. The bridge is Orange on the axillary, inguinal, and marginal laminae as well as on the lateral extensions of the pectoral and abdominal laminae.

The head skin is black. Three lines (Aniline Yellow) enter the posterior margin of the eye; these grade posteriorly on the neck into Primuline Yellow and Old Gold. The most dorsal and most ventral (orbital) of these three lines are the widest and most prominent. Two faint yellowish lines enclosed by these two broad lines represent the usual fourth and fifth lines that enter the margin of the eye. The median head line is not connected to the canthal lines, but is connected to one of the five lines on the upper eyelid and extends posteriorly for about 8 mm. behind the posterior edge of the eye. The paramedian head lines begin on the upper eyelids and extend posteriorly to varying distances along the neck. A post-ocular stripe begins at the posterior corner of the eyelids and extends as far posteriorly as the margin of the carapace. These major head lines are usually separated by one faint yellowish line. The chin has an inverted U-shaped Lemon Yellow blotch, attached to a black-bordered median bar on the lower beak. The ends of this figure continue as the major broad yellow bands on the neck. Between them a third major yellow band begins about 15 mm. posterior to the rear edge of the lower beak and continues to the edge of the plastron. There is a Lemon Yellow line on the upper beak, beginning at the nares and continuing onto the lower beak as a black-bordered blotch.

The forelimbs have a wide (about 7 mm.) Lemon Yellow band on the anterior face at the level of digits 2, 3, and 4, and the dorsal edge of the limb has a yellow line. There is a broad (2 mm.) band on the ventral edge of the forelimb. The webs are yellow. Between the elbow and the carapace there are 8 yellow lines on the black skin. The hind limbs are black dorsally, with the exception of a yellow band on the dorsal aspect of the thigh. Ventrally, the hind limbs are yellow (except for the black plantar surfaces) and variously mottled with black. Between the knee and the vent there are 7 vertical yellow lines on the black skin. The tail is stout, cylindrical, and tapering (22 mm. from vent to tip), and the vent lies approximately 16 mm. behind the posterior edge of the plastron. The tail is yellow laterally and black dorsally, with a yellow mid-dorsal line on the distal half. Two faint paramedian yellowish lines are indicated on the dorsum of the tail. The penis is extruded and is black.

Description of allotype.—An adult female (fig. 106) with the following measurements: CL, 187; PL, 169; C3/4, 103; C5/6, 122; C8/9, 117; CW, 126; head width, 28.0; D, 82; width of posterior lobe of plastron, 72.3; width of bridge, 55.8. Ratios: D/CW, 0.65; C5/6/CL, 0.65; CW/CL, 0.67. The shell is oval in outline when viewed dorsally and is highly domed; the greatest width of the carapace is at the level of marginal 7 and the greatest height at central 3. There is a slight mid-dorsal keel. The shell tapers rapidly anteriorly and is stout and appears to bulge at the level of lateral 3. The marginals are moderately flaring from marginal 7 posteriorly and marginals 4, 5, and 6 are almost vertical. The constricted appearance of the holotype and of most males is not demonstrable in the females of such large size. The carapace is brown in color and the reticulations and mid-dorsal line are broad (as wide as 2.5 mm.) and prominent. The carapace is widely edged with dull orange or yellow, and the juncture of this edging with the reticulum produces the isolated islands of brown ground color on the marginal seams as in the holotype. The plastron is immaculate and orange. The bridge has the usual dumbbell-shaped figure entire, on the lateral extensions of the pectoral, abdominal, axillary, and inguinal laminae on the left side, and separated at the pectoral-abdominal suture on the right. The ventral surface of the marginals lacks any black blotches or markings.

The head skin is brownish black. Five lines enter the posterior margin of the eye; of these the dorsal and ventral (orbital) are most prominent, the median are somewhat less so, and the remaining two

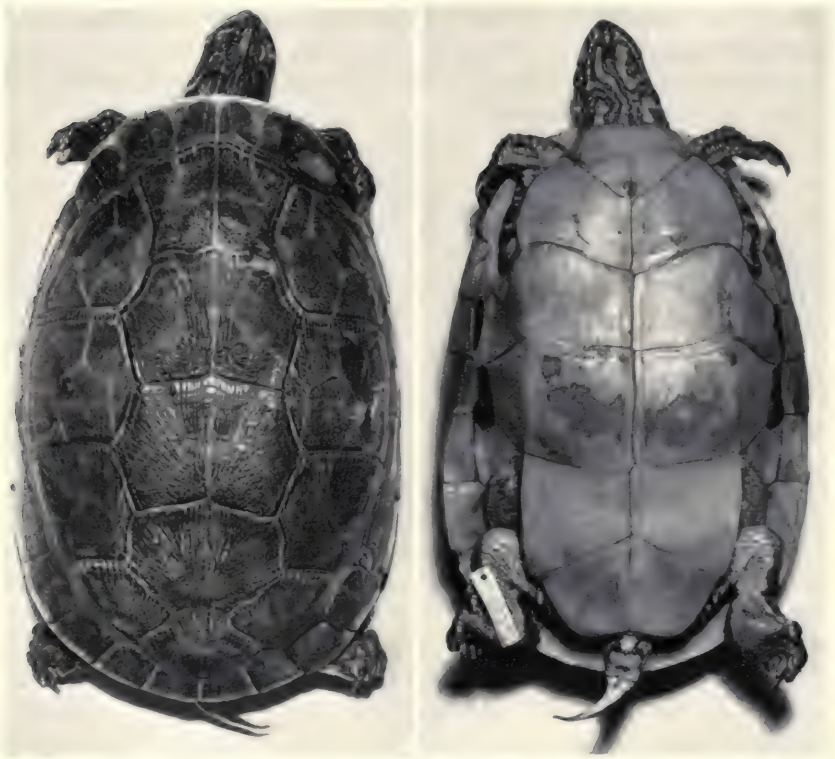

FIG. 106. Dorsal and ventral views of the allotype of *Deirochelys r. chrysea* (UMMZ 100371) from 5 miles west of Florida City, Dade County, Florida.

are fainter still. The median line is not joined to the canthal line, and extends far back on the neck (which is hardened in position and cannot be extracted from the shell). The paramedian lines begin about 5 mm. behind the eye. The details of head striping are much as in the holotype, except that usually 3 faint lines separate the major head stripes. The throat pattern is asymmetrical and consists of two lateral yellow bands which begin just posterior to the lower beak. The left band turns dorsally and ends at the angle of the jaws; the right ends posteriorly to form the right major band on the neck. The left major neck band begins posterior to the angle of the jaws and continues posteriorly with its mate. There is no well-defined median ventral neck band. The coloration and pattern are essentially those of the holotype; there are 9 vertical bands between the knee and the vent, however. The tail is long and terete (32 mm. from vent to tip) and the vent is located 14 mm. behind the

posterior margin of the plastron. The tail is yellow ventrally and black dorsally, with a pair of paramedian yellow stripes on the dorsum; the stripes join to form a single median dorsal yellow line on the distal half of the tail.

JUVENILES

Fifteen juveniles of *Deirochelys r. chrysea* demonstrated the characters of this subspecies. The carapace lengths of this series range between 31.6 mm. and 79.0 mm. The ratio of CW to CL varies between 0.81 and 0.96, with generally the lower ratios for the larger specimens. The shell shape, other than in the very smallest individuals, is markedly cuneiform, with the posterior half of the carapace widely flaring. The carapace is brown dorsally, and the yellow reticulum and mid-dorsal line are wide and boldly prominent. The margin of the carapace is widely edged with orange or yellow. The carapace is high mid-dorsally and the ratio of D to CW varies between 0.50 and 0.60. The orange edging of the carapace may involve as much as one-third of the marginal laminae posteriorly, and when the edging is so broad, it joins the yellow reticulation broadly on each marginal scute. In one individual (UF 2906) the dorsal reticulation is faint, but present.

The plastron is immaculate and yellow (orange in fresh material) in all specimens. The bridge pattern varies between a complete absence of any markings on either marginals or the bridge laminae proper (USNM 131832, ChM 54.237.4) to a completely expressed pattern of the usual dumbbell-shaped figure on the inguinal and axillary laminae and on the lateral extensions of the pectoral and abdominal laminae. Of the thirteen specimens with some markings on the bridge region, seven lack any marginal black dots, and an eighth has these only feebly expressed. The dumbbell-shaped figure may be reduced to merely a small blotch on the inguinal lamina. There is thus a tendency toward reduction of the bridge markings, and this tendency is clearly shown in the entire lot of *D. r. chrysea*.

The coloration of the soft parts is typical of the species. There are five lines entering the posterior margin of the eye, and although these may be of equal width (CNHM 46273) usually the median, dorsal, and ventral (orbital) stripes are the most prominent. In all specimens save one (AMNH 65620) the median head stripe does not join the canthal line.

The chin and neck markings are complex and variable but typically consist of a median mental blotch on the lower beak,

surrounded by a triangular figure which is produced posteriorly into a median yellow line on the chin. Two broad yellow stripes begin at the postero-lateral sides of this triangle and continue posteriorly as the conspicuous broad yellow lines on the neck. In some specimens these two broad lines are joined laterally and dorsally to the yellow or orange line on the upper beak.

In the three smallest specimens (carapace lengths 31.6 to 36.3 mm.) the carapace laminae show the rugose condition of the primary laminae. In specimens of carapace lengths between 45.6 and 69.4 mm. new growth is smooth, and the rugose primary laminae are clearly distinct from the secondary laminae. Specimens of carapace lengths between 59.0 and 79.0 mm. have lost the shagreened appearance of the carapace laminae and these plates are now either smooth or show the fine striae typical of the adult. The transition between these two conditions occurs in *D. r. chrysea* in turtles between 60 and 70 mm. in carapace length.

SUBADULTS

Eighteen subadults (carapace lengths between 79.3 and 141.1 mm.) show the amplification of the trends demonstrated in the juveniles. The carapace continues to develop in a wedge shape and marginals 5 and 6 are almost vertical while marginals 7 through 9 are widely flaring. The ratio of CW to CL varies between 0.68 and 0.80, while the ratio of D to CW varies between 0.44 and 0.62. The reticulum is broad and prominent on a dark brown background, and the mid-dorsal line may be either prominent or obscured to a fine line. The yellow edging of the carapace is prominent and may be quite broad. Compared to *D. r. reticularia* at the same stage of development, the dorsal pattern is far more prominent and the reticulum is wider in the present form.

The plastron is immaculate in all specimens. The bridge lacks the dumbbell-shaped figure as well as the marginal markings in one specimen, and eleven specimens have only the figure and lack the marginal blotches at the bridge. The remaining six specimens have some indication of the dumbbell-shaped figure and the marginal blotches, although both may be merely suggested. The marginal blotches are usually, when fully expressed, complete circles (sometimes with hollow centers), restricted either to a single marginal lamina or encroaching slightly upon the next posterior lamina. The dumbbell figure may be solid or practically hollow. When the bridge figure is reduced, it may remain as two dark smudges over-

lying the axillary-pectoral and inguinal-abdominal sutures, respectively.

The pattern of the head, chin, and neck is as described for the juveniles. One individual has the median head line joined to the canthal line.

ADULTS

Males.—Twenty-eight males are available, and this series shows the variation in adult pattern and size in male *D. r. chrysea.* In general the cuneiform outline of the shell is preserved except in old males, which are more ovoid in carapace shape. The dorsal reticulations and mid-dorsal line are usually prominent, but in a few individuals they are less so. There seem to be two general variants in ground color of the carapace. One group consists of individuals in which the ground color is light brown to olive in color, and the reticulum is broad and persistent. In other individuals the ground color is dark brown or almost black, and here the reticulum is often somewhat obscured, due to darkening of the orange pigments of the reticulum as well as encroachment of the carapace pigment on to the reticulum. However, in most cases the reticulations and the mid-dorsal line are quite obvious.

One specimen has the bridge completely immaculate, and fifteen lack the marginal spots on the bridge. In the remainder the dumbbell-shaped figure is variously expressed, and the largest individual (UF 534) shows obsolescent hollow smudges on the bridge at the axillary-pectoral and inguinal-abdominal sutures. This may indicate that at very large sizes the bridge markings of males become obsolete.

The head markings are as already noted; three individuals have the median head stripe joined to the canthal line, while the remainder of the specimens have this median line separate and unjoined.

Females.—Except in very large and old individuals the twenty adult females show that the reticulations and the mid-dorsal line remain distinct and brightly colored. The edging of the carapace is prominent and very wide; the allotype represents an extreme in this regard since the yellow edge to the marginals extends broadly upon the marginals, and the juncture of this edge with the terminations of the reticulum upon each marginal results in cutting off the almost circular blotches of the dorsal ground color at the intermarginal sutures.

In no specimen does the median head line join the canthal line.

The carapace is as usual immaculate. Two individuals have the bridge completely immaculate, while the marginal spots are lacking in eleven. The remainder have the bridge pattern variously expressed.

Intergradation between *D. r. reticularia* and *D. r. chrysea* occurs in a relatively narrow band across the Florida peninsula just north of Alachua County in the central and eastern portion of the state, and in Levy County on the western seaboard. Intergrades have been examined from the following Florida localities: Taylor Co., 17 miles southeast of Perry, 1; Dixie Co., 1.5 miles southeast of Cross City, 1, 3.2 miles southeast of Clara, 1; Levy Co., 10 miles south of Chiefland, 1, 7 miles northwest of Otter Creek, 1, 4.7 miles northwest of Otter Creek, 1; Gilchrist Co., no other locality, 1; Clay Co., no other locality, 1. These few specimens are intermediate between *D. r. reticularia* and *D. r. chrysea* in that the color of the carapace begins to approach the black or dark brown coloration of *D. r. reticularia* and the dorsal reticulum is progressively more narrow and inconspicuous in specimens collected from south to north. In this latter character, the specimens from Dixie and Levy counties are closer to *D. r. chrysea* (the reticulum is broad), but the individuals from Taylor, Clay, and Gilchrist counties are closer to *D. r. reticularia*. The plastral color, which is also diagnostic between these two subspecies, cannot be determined from this preserved material, and no living examples from the area have been studied.

Occasional specimens from the geographic range of *D. r. reticularia* resemble *D. r. chrysea* in shape of carapace and width of reticulum. A single individual from southern Mississippi and two from west-central South Carolina deserve mention in this regard. These specimens have been designated herein as *D. r. reticularia* in spite of this resemblance to *D. r. chrysea* and serve to emphasize the close relationship between the two subspecies occurring east of the Mississippi River.

In addition to the holotype of *D. r. chrysea*, color notes have been taken from two live specimens of this subspecies (adult male from 3.5 miles north of Okeechobee, Okeechobee Co., Fla.; juvenile from Lake Yale, Lake Co., Fla.). Color notes from eight live specimens of *D. r. reticularia* have also been obtained (adult female from Lake Moultrie near Pinopolis, Berkeley Co., S.C.; subadult female from Santee National Wildlife Refuge, Lake Marion, Clarendon Co., S.C.; three adult females from 2.1 miles north, thence 1.2 miles west of Cainhoy, Berkeley Co., S.C.; juvenile from 0.9 miles north

of Cainhoy, Berkeley Co., S.C.; adult female from 11 miles west of Bogalusa, Washington Parish, La.; adult male from 2.1 miles north, thence 1.2 miles west of Cainhoy, Berkeley Co., S.C.). Colors of these ten specimens are presented in Tables 2 and 3; colors are tabulated for each specimen in the order as listed above.

Inspection of Tables 3 and 4 shows that the colors of the Floridian subspecies are in general brighter than those of *D. r. reticularia*. This is especially true of the color of the plastron and the bridge. The skin markings are also somewhat paler in *D. r. reticularia*, and in this race the dorsal head and neck markings show a pronounced tendency toward greenish in contrast to the bright yellows of *D. r. chrysea*. Unfortunately, adequate series of live *D. r. chrysea* are not available for study and comparison with *D. r. reticularia*, and no attempt has been made to assess differences in coloration between the sexes (males appear to be somewhat more brightly colored than females) and between juveniles and adults, because of the meager material available. The data here presented indicate that there are differences in coloration between the peninsular and mainland populations of *Deirochelys*.

Wright and Funkhouser (1915, pp. 117–118) described the plastral coloration of an adult chicken turtle from the Okefinokee Swamp as "reddish-yellow, median plates with a distinct tinge of red" and that of a juvenile as "clear lemon yellow." It is possible that the brightly colored plastron typical of *D. r. chrysea* occurs in individuals as far north as the Okefinokee Swamp region of southern Georgia, but on the basis of shell outline and proportions, material from the Okefinokee Swamp is assigned to subspecies *reticularia*. Additional fresh material from this area may show that southeastern Georgia is an area of intergradation between *D. r. reticularia* and *D. r. chrysea*.

Deirochelys reticularia miaria subsp. nov.

Deirochelys reticularia Dellinger and Black, 1938, Occ. Pap. Univ. Arkansas Mus., no. 1, p. 45; Schwardt, 1938, Univ. Arkansas Coll. Agric., Bull. 357, p. 45; Pope, 1939, Turtles U. S. and Canada, pp. 234–235 (part); Brimley, 1939–43, Reptiles and Amphibians N. Car., Carolina Tips, Installment 31, second unnumbered page (part); Ditmars, 1946, Reptiles N. Amer., pp. 418–419 (part); Brown, 1950, Check List of Reptiles and Amphibians, Texas, p. 234 (part); Webb, 1950, Herpet., **6** (5), pp. 137–138; Carr, 1952, Handbook of Turtles, pp. 316–319 (part); Smith and Sanders, 1952, Texas Jour. Sci., **4**: 211; Guidry, 1953, Herpet., **9** (1), p. 56; Schmidt, 1953, Check List of N. Amer. Amphibians and Reptiles, p. 104 (part); Carr and Goin, 1955, Reptiles, Amphibians and Fresh-water Fishes of Fla., p. 246

(part); Mertens and Wermuth, 1955, Zool. Jahrb. (Syst.), **83** (5), pp. 348–349 (part).

Deirochelys reticulata Agassiz, 1857, Contr. Nat. Hist. U. S., **1**: 441 (part), **2**, pl. 2, figs. 1–3; Siebenrock, 1909, Zool. Jahrb., suppl. vol. **10** (3), p. 485 (part).

Chrysemys reticulata True, 1883, Bull. U. S. Nat. Mus., **24**: 35 (part); True, Fish. Indust. U. S., sec. 1, p. 157 (part).

Holotype.—CNHM 37478, adult male, taken at College Station, Brazos County, Texas, on April 17, 1941, by K. P. Schmidt, J. M. Schmidt, C. M. Barber, and A. Flury.

Allotype.—USNM 85145, subadult female, taken at White Rock Creek, 4 miles northeast of Dallas, Dallas County, Texas, on April 16, 1932, by C. E. Burt.

Paratypes.—TEXAS: Dallas Co., 6 miles southeast, ½ mile east of Trinity River (TNHC 8907); Freestone Co., 20 miles east of Teague (BCBC 4694); McLennan Co., south of Waco (BCBC 4690), 5 miles east of Waco (SM 157), 3 miles east of Axtell (SM 0085, 160), Trading Horse Pond (SM 6684), 1 mile southeast of Harrison Switch, Kirkpatrick Lake (CNHM 52995); Leon Co., 5 miles west of Marquez (CNHM 46282–3, 52996); Brazos Co., College Station (TCWM 4680), Green Lake (TCWM 691); Grimes Co., 7 miles northeast of Navasota (TCWM 7278); Liberty Co., 3.7 miles north of Hull (TNHC 8906); Austin Co., 11 miles northwest of Sealy (BCBC 225), San Felipe (CNHM 37482); Harris Co., 1.2 miles southeast of Bammel (TNHC 6035), Houston (CM 5443–5), South Houston (ChM 55.39.3, TNHC 8905); Colorado Co., 8 miles from Eagle Lake (TCWM 326), Rock Island (UK 3145); Ft. Bend Co., 3 miles south of Beasley (BCBC 3044–6, 3048, TCWM 4679, UIMNH 2397), Fresno (UIMNH 28503, 31696), 1 mile west of Orchard (AMNH 36726); Lavaca Co., 22 miles southeast of Yoakum (TNHC 7325).

The following specimens of *D. r. miaria* have been examined and are not designated as paratypes: ARKANSAS: Faulkner Co., near Conway, 1; Craighead Co., 6 miles west of Jonesboro, 1; Jackson Co., 3 miles south of Swifton, 1; Prairie Co., Duvall's Bluff, 1; Lonoke Co., 2.6 miles east of Carlisle, 1, Lonoke, 1; Drew Co., Jerome, 2. OKLAHOMA: Cleveland Co., 15 miles east of Norman, 1; Seminole Co., Bowlegs, 1; McCurtain Co., no other locality, 1. TEXAS: Hopkins Co., 2 miles west of Saltillo, 2; Harrison Co., 5 miles northeast of Karnack at Caddo Lake, 1; Chambers Co., 5 miles east of Anahuac, 1 (not mapped); Jefferson Co., 2 miles west of Sabine Pass, 1. LOUISIANA: no other locality, 1; Morehouse

Parish, Mer Rouge, 1, Prairie Mer Rouge, 2 (not mapped); Richland Parish, Rayville, 5; Franklin Parish, Wisner, 3; Concordia Parish, Ferriday, 6; Jefferson Davis Parish, 2 miles west of Welsh, 1; Acadia Parish, Rayne, 9; Orleans Parish, New Orleans, 6; parishes indeterminate (not mapped), Urosius, 1, Bayou, 2, south central Mississippi Valley, 6.

Geographic distribution.—West of the Mississippi River in Louisiana, southern and eastern Arkansas, southeastern Oklahoma, and eastern Texas (see map, fig. 102).

Diagnosis.—*Deirochelys r. miaria* differs from both *D. r. reticularia* and *D. r. chrysea* in possessing a plastral pattern of the seam-following type at all ages; this pattern is usually present but obsolescent in old adults. Adults usually have an unstreaked chin and throat.

The carapace is oval in shape and flatter than that of both *D. r. reticularia* and *D. r. chrysea.* See Tables 1 and 2.

Description of holotype.—An adult male (fig. 107) with the following measurements: CL, 144; PL, 130; C3/4, 87; C5/6, 104; C8/9, 100; CW, 111; head width, 22.8; D, 56; width of posterior lobe of plastron, 62.3; width of bridge, 42.0. Ratios: D/CW, 0.50; C5/6/CL, 0.72; CW/CL, 0.77. The shell is oval in outline when viewed dorsally and is quite flattened. The greatest width of the carapace is at the level of marginal 8 and the greatest height at central 2. The posterior marginals flare moderately from marginals 7 to 9, but this is not so noticeable in the posteriormost marginals. There is no constriction at the level of marginals 5 and 6 as in *D. r. chrysea,* and these marginals slope medially, not vertically. The reticulum and mid-dorsal line are wide (almost 3 mm. broad) and, although obvious, the color is only slightly lighter than the olivaceous ground color of the carapace. The carapace is inconspicuously edged with yellow on the sides, and no yellow border occurs on the anterior or posterior marginals. The terminations of the reticulum continue to the edge of the carapace and are slightly widened at the very edge of the shell. The plastron is yellow, with heavy deposition of dark pigments. The age of this individual accounts for the deposition of brown pigments over the entire surface of the anal laminae, and the central portions of the humeral and abdominal laminae. Anteriorly, brown pigments follow the median and lateral seams, and the gular, humeral, and pectoral laminae are diffusely mottled with brown. The bridge pattern consists of the entire dumbbell-shaped figure as well as dark brown

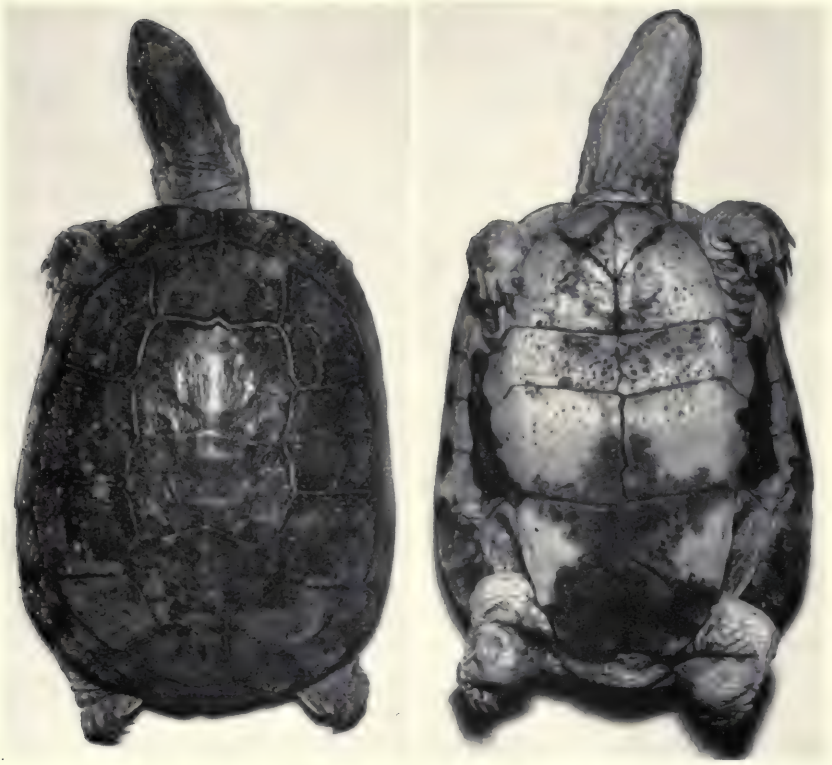

FIG. 107. Dorsal and ventral views of the holotype of *Deirochelys r. miaria* (CNHM 37478) from College Station, Brazos County, Texas.

blotches at the seams between marginals 3–7, on the left side, and between marginals 2 and 3 and 7 and 8, on the right. The ventral surface of the marginals from marginal 8 around the posterior circumference of the shell is clouded with brown.

The head skin is dull tan (faded?). Two major yellowish lines enter the posterior margin of the eye; between them are faint indications of the usual three enclosed lines, the median of which is slightly more prominent. The median line is obscured but appears not to have been joined to the canthal line. Two paramedian lines begin about 3 mm. posterior to the eye and extend posteriorly along the neck to the carapace. The post-ocular stripes begin about 5 mm. behind the eye and continue as major neck stripes to the carapace edge. There is no indication of striping between these major head and neck lines. The chin and ventral surfaces of the neck are

practically unstreaked. The usual ventral neck markings begin at about the level of the tympanum and continue inconspicuously to the margin of the plastron. The lower beak is flecked with black along its edge and is elsewhere clear yellow, while the chin and anterior ventral surface of the neck are yellow, with very faint indications of the throat streaking typical of the species.

The forelimbs have a broad (12 mm.) yellow band covering two-thirds of the anterior face and the lower edge of the limb; the upper edge likewise has a yellow line. Digits 3 to 5 are yellow, as are the webs also. Between the elbow and the carapace there are 7 vertical yellow lines on the tan ground color. The hind limbs are tan dorsally and yellow ventrally, except for the plantar surfaces, which are tan. A yellow stripe extends along the medial aspect of the limb and foot. Between the knee and the vent there are 7 vertical yellow lines on the tan skin. The tail is stout, cylindrical, and tapering (41 mm. from vent to tip) and the vent lies about 17 mm. posterior to the posterior edge of the plastron. The tail is yellow ventrally and brown dorsally, with a median yellow line on its distal half.

Description of allotype.—A subadult female (fig. 108) with the following measurements: CL, 134.6; PL, 122.7; C3/4, 81.5; C5/6, 94.9; C8/9, 92.5; CW, 100.4; head width, 21.7; D, 50; width of posterior lobe of plastron, 60.0; width of bridge, 42.7. Ratios: D/CW, 0.50; C5/6/CL, 0.71; CW/CL, 0.75. The shell is oval and flattened in outline when viewed dorsally. The greatest width of the carapace is at the level of marginal 7 and the greatest height at central 3. The posterior marginals flare moderately from marginal 8 and the lateral marginals are almost vertical. The dorsal ground color is tan and the reticulations are very fine and almost invisible. The carapace is inconspicuously edged with yellow. The carapace laminae are somewhat translucent and the sutures of the underlying bones are apparent. The plastron is yellow with the completely developed seam-following brown plastral pattern. This pattern involves the entire central seam except for the intergular portion and the extreme posterior quarter of the inter-anal suture, and all except the lateralmost portions of the remaining plastral seams. At its widest, the brown pigment presents an area 8 mm. wide on the anal laminae; it is absent on portions of the inter-abdominal seam. On all lateral seams, the pigment lies on the posterior margin of the preceding lamina with the exception of the femoral-anal seam, where two small (4 mm.) circles of pigment lie at the end of the pigmented seam pattern and project posteriorly

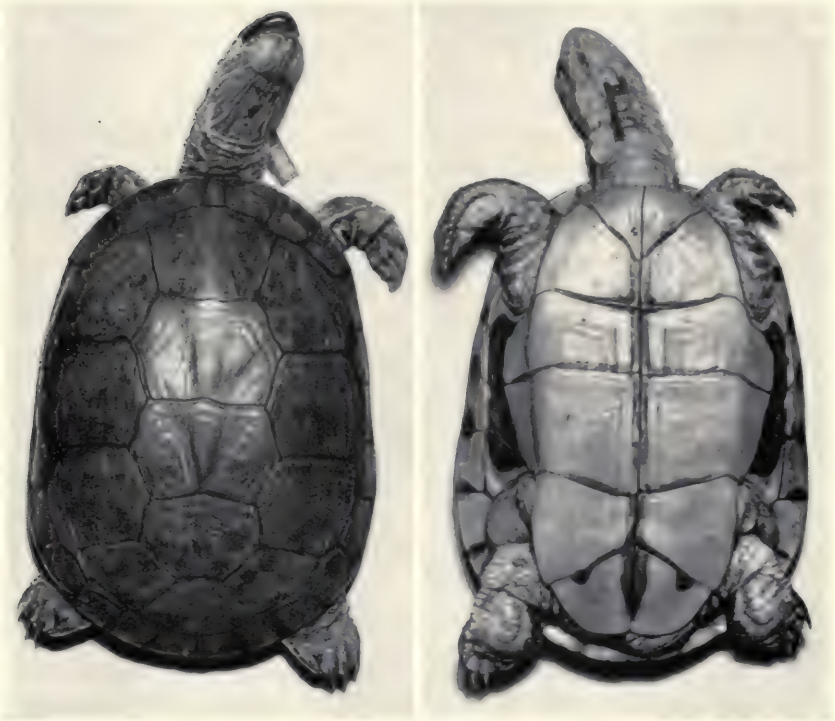

FIG. 108. Dorsal and ventral views of the allotype of *Deirochelys r. miaria* (USNM 85145) from White Rock Creek, 4 miles northeast of Dallas, Dallas County, Texas.

onto the anal laminae. The bridge has the complete dumbbell-shaped figure, which is somewhat hollowed centrally. The marginals have a brown circular spot at all the marginal seams except at the junction of the precentral and marginal 1.

The tan head skin shows the same basic pattern as described for the holotype although it differs in some details. There are five rather than two major lines entering the posterior margin of the eye, but the dorsal and ventral (orbital) are the major and most prominent of these. The median head line is unattached to the canthal lines. There is but one faint yellowish line between the major head lines. The post-ocular lines begin at the eye. The throat, chin, and ventral surface of the neck are immaculate yellow and show no trace of streaking. The lower beak is yellow and slightly mottled with brown along its free edge. The pattern and coloration

of the remaining soft parts are essentially the same as those of the holotype.

JUVENILES

Thirty-eight juveniles of *Deirochelys r. miaria* are available. These range in carapace length from 30.8 to 77.8 mm. The very young individuals (fourteen, with carapace length between 30.8 and 37.1 mm.) are almost circular in outline, the ratio of CW to CL varying between 0.90 and 0.96. In all the carapace is olive in coloration, with the customary yellowish reticulum. There is a moderately well-developed mid-dorsal yellow line. The margin of the carapace is characterized by a more or less well-developed yellow to orange border; in one individual (TU 6355, no. 3) the edge of the carapace is extensively bordered with yellow so that the olive dorsal coloration along the marginal seams is reduced to dagger-like points and on marginals 4 to 7 the encroachment of the yellow pigment has caused the formation of olive circular "islands" on the marginals. No other specimen is quite so extreme.

The plastron is yellow and the black plastral pattern is of the seam-following type. At its maximum, this pattern involves the median sutures between the humeral, pectoral, abdominal, femoral, and anal laminae, and extends laterally on the sutures between the gular and humeral, humeral and pectoral, pectoral and abdominal, abdominal and femoral, and femoral and anal junctures. These lateral branches lie on the posterior margin of each lamina. The pattern does not reach the bridge at any point. At the union of the femoral and anal laminae there is an increase in width of the black pattern, and this customarily extends posteriorly along the median inter-anal suture. There is a lateral expansion of pigment at the tips of the branch of pigment along the femoral-anal suture, extending posteriorly onto the anal lamina. One individual (USNM 17) lacks the plastral pattern, but another specimen from the same locality has it fully expressed.

On the lateral portions of the pectoral and abdominal laminae the bridge is marked by a dumbbell-shaped figure that encroaches onto the inguinal and axillary laminae. This figure is usually entire, but it may be divided into two or three separate centers of pigmentation or may be reduced to an anterior and a posterior blotch; it is not absent on any specimen. The marginals have, at the level of the bridge, a black spot at each suture; these spots lie on the marginal immediately anterior to the suture. Two individuals lack these marginal spots.

The soft parts are typical of the species. The markings of the chin and neck are complex, but their simplest form consists of an inverted V, with the apex on the beak of the lower jaw and extending posteriorly along the ventral side of the neck. Three or five lines enter the eye; if five are present, these are three major lines (most ventral is the orbital) plus two additional fine lines between the three major ones.

The carapace laminae are rugose, the rugae on the anterior portion of the central and lateral laminae being arranged to form weak striations.

The remainder of the juvenile individuals (carapace lengths between 35.1 and 77.8 mm.) resemble the younger individuals in most details of coloration. The plastral pattern is well developed in all specimens, and there is a tendency for the median portions of the figure to be broader than the lateral branches. If the lateral branches of the figure are lost, the branches between the gular and pectoral laminae disappear first. The marginal spots are generally restricted to the marginal laminae anterior to the suture, but in several individuals these spots are expanded onto the marginal lamina immediately posterior to the suture. Likewise the dumbbell-shaped figure shows a slight tendency to become hollow, with either an anterior and posterior light area on the lateral edges of the pectoral and abdominal laminae, or a continuous light area within the entire figure.

Perhaps the most striking change at this period is the disappearance of the markings on the throat and ventral neck. The black lines are obsolescent on the ventral portion of the neck in an individual with a carapace length of 54.5 mm. and are completely lacking in an individual 53.7 mm. in carapace length. The neck is thus uniformly yellow. Of the lot of twenty-four individuals under consideration, twelve have either a clear yellow throat or the black stripes are faded and obsolescent. However, one of the largest of the lot (carapace length 75.7 mm.) retains the black neck markings. Although the throat and neck may be clear yellow, the black markings are retained on the lower beak.

The ratio of CW to CL at this size varies between 0.80 and 0.92, with the smaller individuals having the higher ratios. The carapace has become more oblong and in most individuals is parallel-sided, with little posterior flare. The aspect of the turtle is depressed; the reticulations on the carapace may be almost absent and barely indicated, or they may be prominent. There may be

a faint mid-dorsal line indicated, but it is never prominent as in the very young individuals.

The texture of the carapace laminae is no longer rugose as in the very young specimens, but is now smooth or but weakly striated, foreshadowing the striated condition in the adults. An individual (CM 24565) with a carapace length of 42.9 mm. shows the smooth new growth about the primary carapace laminae, in strong contrast to the original hatching laminae, which are markedly rugose. With increasing size, the rugosity of the original laminae becomes more obscure, and it disappears completely in specimens with carapace lengths exceeding 50 mm.

SUBADULTS

Seventeen individuals (carapace lengths between 79.7 and 139 mm.) are considered to be subadult. The carapace is olive in color and extremely flattened for *Deirochelys;* the sides are almost parallel for the distance between the fourth and seventh marginals. The ratio of CW to CL varies between 0.72 and 0.81. The dorsal reticulum is almost obsolete and hardly evident. A faint mid-dorsal line is sometimes present. In some individuals the laminae are almost translucent, the bone sutures below the centrals being clearly visible.

The plastral figure is still apparent but some individuals show the beginnings of the expansion of the figure. The smallest specimen (UIMNH 31696) to show this melanistic tendency measures 96.8 mm. in carapace length. In this specimen the dark pigment has expanded laterally from the central seam onto all the plastral laminae except the gulars and pectorals and is especially prominent at the junction of the abdominals and humerals. Two other turtles (carapace lengths of 131 and 139 mm.) also show the same phenomenon, but the pigment is less extensive, occurring principally on the posterior half of the plastron. The remainder of the series (of intermediate size between these incipiently melanistic individuals) has the customary plastral pattern. There are no concomitant changes in the coloration of the soft parts or the carapace.

With but two exceptions, the throats and necks of this lot of subadults are clear yellow. One of these exceptions is the small individual mentioned above as melanistic, and other (USNM 95345) is a crushed individual with a plastral length of 106.6 mm.

The spots on the ventral surface of the marginals are either completely circular or semicircular, the intermarginal sutures limiting the posterior development of the circles.

ADULTS

Males.—Twenty-three males show the continuation of the changes indicated in the subadult group of specimens. The carapace retains its flattened appearance, and the sides of the shell are almost parallel. The dorsal reticulum and the mid-dorsal line may be almost absent or quite wide, and this condition is not correlated with the provenance of the specimen or with age. The melanistic trends noted in subadults are expressed more fully in adult males; almost all individuals in this group show some modification of the plastral figure. It may be poorly expressed and represented by a dark smudge or blotch at the juncture of the anal and humeral laminae and absent on the anterior portion of the plastron; or it may be fully expressed on all the plastral laminae, with increasing pigmentation occurring along the median seams. The largest male (UOMZ 10940) has a carapace length of 161 mm. and has the plastral pattern restricted to an irregular blotch on the posterior three pairs of laminae; the remainder of the plastron is virtually immaculate and there is no seam-following figure.

Of this lot of males, eleven have a clear yellow or only faintly streaked throat, while the remainder have a heavily streaked throat. This is correlated with neither age nor geography.

Females.—Sixteen females resemble the males in details of carapace coloration. With increasing size the flatness of the turtle becomes less obvious, and younger individuals show the more flattened condition. The old adults have the high-domed shell which is characteristic of female *Deirochelys*, and the animal is ovoid in appearance.

Only one female has the plastral figure expressed completely and without the additional black pigment. Usually the plastral pattern is absent over the entire plastron except for an irregular smudge at the intersection of the humeral and anal laminae, and even this smudge is lacking in one specimen.

All but one female have clear unstreaked throats.

I have examined one live specimen of *D. r. miaria*, a subadult female taken 5 miles east of Anahuac, Chambers County, Texas. The coloration of this individual in life was as follows: carapace, Dark Citrine; reticulum, Orange-Citrine and very obscure; carapace edge Aniline Yellow; plastron Buff-Yellow, pattern black; bridge Apricot Yellow, grading to Light Cadmium on ventral surface of marginals 2 to 4 and upon axillary lamina. Coloration of beak Martius Yellow; dorsal head and neck markings Oil Yellow; lower orbital

line and chin Picric Yellow, chin and anterior portion of ventral neck skin completely unstreaked; tail, hind limb, and rump lines Picric Yellow; forelimb band Picric Yellow.

Deirochleys r. miaria occurs on the west Gulf coastal plain and its eastern border is the Mississippi River. It is not surprising that this large river acts as a boundary between two subspecies of the aquatic chicken turtle; Carr (1952, p. 318) has pointed out that *Deirochelys* "is essentially an inhabitant of quiet water—ponds, marshes, sloughs, and ditches. It is only rarely found in streams, and then usually in the quieter reaches or arms where pond conditions are approached." However, from the lower reaches of the Mississippi River there are fourteen anomalous or questionable specimens which require comment, as follows:

(1) UMMZ 96516, from 20 miles north of Baton Rouge, La. This individual, if the locality is correct, is from the east side of the Mississippi River. It is, however, typical of the subspecies *miaria* in that it possesses a low, flattened, olive-colored carapace, unmarked chin and neck, and plastral pattern. Baton Rouge lies on the Mississippi River and it is conceivable that this specimen is from west, rather than north of the city, as the locality data indicate. It is not here interpreted as an occurrence of *D. r. miaria* east of the Mississippi River.

(2) UF 874, from near Plaquemines, La. Plaquemines lies on the west bank of the Mississippi River, and this individual is a juvenile typical of *D. r. reticularia*, even possessing the plastral spot at the juncture of the femoral and anal laminae. Again, the specimen may well have come from the eastern side of the river and the locality is here interpreted as incorrect.

(3) CU 1750, from Plaquemines, La. This specimen is typical of *D. r. reticularia* and the comments above (see 2) apply equally well to it.

(4) UF 1737 (2), from 6 miles from Luling, La. Luling lies on the west bank of the Mississippi River. Since no direction is indicated from this village, it is conceivable that these two juvenile individuals are from the east rather than the west side of the river. They are typical *D. r. reticularia* and lack any semblance of the plastral pattern of *D. r. miaria*.

(5) UIMNH 94–96 and 98–100, from New Orleans, Orleans Parish, Louisiana. This lot of six juveniles is typical of *D. r. miaria;* all have the completely expressed plastral pattern and low carapace

of that form. New Orleans is located on the north (the east) bank of the Mississippi; the present city limits, however, include a portion of the south (the west) bank of the river. It is presumed that these six specimens came either from that portion of the city which lies on the west side of the Mississippi River or from the west bank of the river "in the vicinity" of New Orleans. These specimens are designated as *D. r. miaria* and have been included in the discussion of variation in that form.

(6) CU 1298 (3), from Schriever, Terrebonne Parish, La. Schriever is situated about 18 miles south of the Mississippi River on the west side of that river near Thibodaux. The three specimens are juveniles. Two have the completely expressed plastral pattern of *D. r. miaria* while the remaining individual has at the femoral-anal suture the plastral spot characteristic of *D. r. reticularia*. Whether this situation indicates intergradation between *D. r. reticularia* and *D. r. miaria* cannot be determined on the basis of these three juvenile specimens; furthermore, intergradation at this locality seems unlikely on the basis of the other specimens from the Mississippi delta region. The patternless individual is here interpreted as being a *D. r. miaria* that lacks a complete plastral pattern; the remaining two typical individuals from the same locality tend to bear out this interpretation.

DISCUSSION

Except for three isolated records, *Deirochelys reticularia* is limited in its distribution to the coastal plain. Throughout its range, the chicken turtle inhabits ponds, lakes, and ditches—in general, lenitic situations—and has not been recorded from fluviatile situations. Of the specimens examined for the present study, chicken turtles from two rivers (judged by the locality data only) are at hand. These include specimens from the Tombigbee River in Alabama and the Chipola River in western Florida; although the data on these specimens indicate specifically that these turtles were river-taken, it is of course possible that they were collected in ponds in the immediate vicinity of the rivers, or from lenitic backwaters. In general, however, *Deirochelys* is not a river inhabitant; in Florida and South Carolina, where I have had experience with this turtle, all specimens were secured from standing water (or water with a very low flow gradient) or from fluctuating pools such as cypress ponds. It is not surprising that the Mississippi River has proven an effective barrier between the subspecies *reticularia* and *miaria*, for this great river appears to be uninhabited by

chicken turtles, and, with the possible exception of its lowermost reaches, thus acts as a barrier to prevent gene flow between the populations on the eastern and western banks of the river.

The three extra-coastal plain records of occurrence of the chicken turtle are from the states of Oklahoma and Arkansas. Webb (1950) has discussed this occurrence of *Deirochelys* in Oklahoma; the two non-coastal plain specimens (Cleveland and Seminole counties) are assumed to have reached this region via the Mississippi and Arkansas rivers. Webb stated (1950, p. 137) that "the migration of *Deirochelys* by way of rivers is incongruous with the habits given by Pope, . . . but it is possible that the preferable habitat of still water ponds could present itself" since "the combination of the torrential rains and the easily eroded sandstone . . . has resulted in the formation of numerous sloughs and ponds, of which the larger are often relatively permanent." The specimen from Faulkner County, Arkansas, is not so far removed from the coastal plain, and may have reached its site of collection via the Arkansas River also. These three specimens from non-coastal plain localities are all typical of the western subspecies, *D. r. miaria.*

Of the three subspecies of *Deirochelys reticularia* herein recognized, *D. r. miaria* differs strikingly from the two eastern forms, while both *D. r. reticularia* and *D. r. chrysea* are rather more closely related. Differentiation on and along the Florida peninsula has been demonstrated in many groups of animals, and likewise in many genera and species of amphibians and reptiles. If degree of difference between subspecies is regarded as a criterion of length of time required for differentiation and subspecies formation, it is apparent that *D. r. miaria* has been isolated from *D. r. reticularia* longer than has *D. r. chrysea.* It is possible that such isolation occurred during glaciation, and that the *Deirochelys* population was at that time split into two sections, one in Florida and southeastern North America, and one in southern Texas and northern Mexico. During this period of isolation, the characteristics of *D. r. miaria* were intensified or developed, and with the return of more clement conditions to the north, *D. r. miaria* invaded more northern and eastern available areas. In the east, during the same period, differentiation occurred on the varyingly extensive Florida peninsula, resulting in the formation of *D. r. chrysea.* It seems preferable to regard both *D. r. chrysea* and *D. r. miaria* as derivatives of *D. r. reticularia.* The occurrence of a plastral blotch in some specimens of *D. r. reticularia* may be interpreted as ancestral; on one hand, this plastral marking has been amplified into the plastral pattern of *D. r. miaria,*

and on the other has been completely lost in *D. r. chrysea*. The latter subspecies also shows a significant reduction of the bridge pattern and marginal markings in the bridge region, while such is not the case in *D. r. miaria*. The shape of the shell of the three subspecies is distinctive; the cuneiform shell of *D. r. chrysea* and the flattened shell of *D. r. miaria* could have been developed most easily from that of *D. r. reticularia* or its precursor.

The absence of *Deirochelys* from most of Mississippi and the extension farther northward on the west side of the Mississippi River are puzzling. It is possible that further collecting in Mississippi will reveal the presence of this turtle in suitable localities in that state and possibly also in westernmost Tennessee, although it has not been taken in Reelfoot Lake, which may conceivably be regarded as suitable habitat. The westernmost limit of the distribution of the chicken turtle is the Balcones Escarpment, and it should be sought in the area between the Escarpment and its known range. *Deirochelys* is unknown from Mexico, and if it occurs as far south as the Rio Grande that river may act as an effective barrier to its further southern distribution. However, one other southeastern pond-dwelling form (*Siren intermedia*) has been taken in Tamaulipas, and the chicken turtle may occur at least in that state.

TABLE 1.—MEASUREMENTS (MEANS AND OBSERVED RANGES) OF ADULT SPECIMENS OF THREE SUBSPECIES OF *Deirochelys reticularia*

Subspecies	Sex	Number	CL	PL	C3/4	C5/6
D. r. reticularia	♂	11	128.2(114.5–147.0)	115.9(102.5–132.0)	74.5(67.0–84.0)	85.6 (71.7–100.0)
D. r. chrysea	♂	28	130.6(110.1–165.0)	115.0 (90.4–150.0)	73.0(62.6–97.0)	84.8 (71.2–110.0)
D. r. miaria	♂	24	126.3 (96.5–161.0)	110.6 (96.5–143.0)	74.3(63.4–101.0)	87.5 (75.3–113.0)
D. r. reticularia	♀	13	187.5(160.6–208.0)	169.2(143.2–190.0)	108.0(89.6–123.0)	122.5 (99.0–144.0)
D. r. chrysea	♀	20	187.7(158.7–227.0)	168.0(145.6–193.0)	105.9(91.0–129.0)	122.9(102.0–148.0)
D. r. miaria	♀	14	177.8(139.0–210.0)	160.1(123.0–193.0)	107.1(82.0–126.0)	126.5 (99.0–157.0)

C8/9	CW	Head width	D	Width of posterior lobe	Width of bridge
83.8 (71.0–100.0)	91.2 (81.5–110.0)	22.3(19.3–25.2)	53.9(45–67)	50.9(44.2–62.1)	37.6(32.7–42.0)
85.9 (72.6–105.0)	91.4 (78.6–110.0)	22.2(19.1–26.6)	53.6(46–68)	51.2(44.5–61.1)	38.2(31.9–48.9)
87.2 (69.9–100.6)	94.0 (79.0–123.0)	20.5(15.7–26.8)	49.2(42–61)	52.1(44.2–66.2)	36.5(29.4–45.1)
121.1(106.4–137.0)	129.3(110.0–144.0)	29.0(25.1–31.7)	78.1(67–86)	71.9(61.0–79.3)	56.7(50.9–66.1)
120.3(100.0–143.0)	129.8(107.4–152.0)	28.5(24.9–33.3)	80.4(70–92)	73.0(61.1–88.0)	57.4(48.8–67.7)
120.6 (97.0–143.0)	129.3(102.9–153.0)	26.8(21.8–31.4)	73.7(62–91)	73.4(60.7–85.6)	54.1(41.8–66.8)

TABLE 2.—RATIOS (MEANS AND OBSERVED RANGES) BETWEEN CARAPACE MEASUREMENTS OF ADULT SPECIMENS OF THREE SUBSPECIES OF *Deirochelys reticularia*

The same number of individuals as in Table 1

Subspecies	Sex	D/CW	C5/6/CL	CW/CL
D. r. reticularia	♂	0.568(0.55–0.59)	0.664(0.62–0.71)	0.710(0.66–0.75)
D. r. chrysea	♂	0.586(0.52–0.67)	0.649(0.62–0.69)	0.700(0.66–0.74)
D. r. miaria	♂	0.524(0.48–0.57)	0.700(0.66–0.74)	0.738(0.62–0.77)
D. r. reticularia	♀	0.611(0.56–0.68)	0.651(0.57–0.72)	0.688(0.64–0.72)
D. r. chrysea	♀	0.623(0.58–0.66)	0.653(0.61–0.70)	0.692(0.65–0.73)
D. r. miaria	♀	0.563(0.50–0.60)	0.711(0.67–0.75)	0.742(0.72–0.77)

TABLE 3.—COLORATION OF SHELL IN LIFE OF TEN SPECIMENS OF *Deirochelys reticularia*

Specimens listed in the order noted in text

	D. r. chrysea	*D. r. reticularia*
Carapace	Chaetura Black (3) black	Medal Bronze black black black black black Olive Blackish Brown (3)
Reticulum	Yellow Ocher Honey Yellow	Citrine Ochraceous-Tawny Buckthorn Brown (obscured) Buffy Citrine Ochraceous-Tawny Buffy Olive Honey Yellow
Edge of carapace	Ochraceous-Orange, blending to Ochraceous-Buff posteriorly Deep Chrome, blending to Light Orange-Yellow posteriorly	Pale Orange-Yellow Yellow Ocher Buff Yellow (absent) Old Gold Yellow Ocher Deep Colonial Buff Reed Yellow
Plastron	Antimony Yellow Baryta Yellow centrally and Deep Chrome peripherally	Pale Orange-Yellow, grading to Orange-Buff on sides of gulars and humerals Pale Orange-Yellow, grading to Orange-Buff on edges of gulars and humerals and lower sides of anterior marginals Maize Yellow Buff-Yellow Buff-Yellow Maize Yellow Cream-Buff Naples Yellow
Bridge	Orange with seams Empire Yellow Light Orange Yellow	Orange-Buff, seams Apricot Yellow Maize Yellow, seams Orange-Buff Baryta Yellow Baryta Yellow Baryta Yellow Capucine Orange Cream-Buff Naples Yellow

TABLE 4.—COLORATION OF SOFT PARTS IN LIFE OF TEN SPECIMENS OF *Deirochelys reticularia*

Specimens listed in the order noted in text

	D. r. chrysea	*D. r. reticularia*
Upper beak	Wax Yellow	Martius Yellow
	(not taken)	Picric Yellow
		Martius Yellow
		Martius Yellow
		Martius Yellow
		Picric Yellow
		Sulphine Yellow
		Citron Yellow
Dorsal head and neck markings	Wax Yellow, grading posteriorly to Old Gold	Pale Lumiere Green
	Picric Yellow, grading posteriorly to Sulphine Yellow	Clear Dull Green-Yellow, grading to Olive Ocher
		Rainette Green
		Pale Olivine
		Glass Green
		Pale Lemon Yellow
		Warbler Green, grading to Sulphine Yellow
		Chalcedony Yellow, grading to Old Gold
Ventral neck markings	Martius Yellow	Light Greenish Yellow
	Martius Yellow and Pale Lemon Yellow	Pale Greenish Yellow
		Picric Yellow
		Picric Yellow
		Pale Greenish Yellow
		Picric Yellow
		Empire Yellow
		Citron Yellow and Massicot Yellow
Tail, hind limb, and rump lines	Martius Yellow	Martius Yellow
	Picric Yellow	Pale Greenish Yellow
		Barium Yellow
		Martius Yellow
		Martius Yellow
		Martius Yellow
		Baryta Yellow
		Barium Yellow
Forelimb stripe	Picric Yellow	Pinard Yellow
	Pale Lemon Yellow	Pale Greenish Yellow
		Martius Yellow
		Picric Yellow
		Picric Yellow
		Picric Yellow
		Pinard Yellow
		(not taken)

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